WATER QUALITY CERTIFICATION
(P.L. 92-500)

In the matter of: Mr. Raymond C. Miller
R.D.4, Box 267A
West Brattleboro, VT 05301
Application for Harrisville Mill
Hydroelectric Project

The Water Quality Division of the Vermont Department of Water Resources and Environmental Engineering (the Department) has reviewed an application for a Water Quality Certification submitted by Mr. Raymond C. Miller (the applicant). The Department has made the following findings:

1. The applicant owns and operates the Harrisville Mill Hydroelectric Project located on the Green River in Halifax. The project has been in operation since 1979 and electricity generated from the facility is sold to a private utility.

2. The dam was originally constructed in 1870. It is a stone masonry structure approximately 65 feet long and 12 feet in height (1350' elevation, datum unknown). It has recently been faced with concrete to reduce leakage. A 20 foot long spillway in the center of the dam has a crest elevation of 1346'. Four feet of flashboards (elevation 1350') extend across this spillway and are designed to fail under flood conditions. These flashboards are usually removed during the summer months and reinstalled in September. The dam creates an impoundment with a surface area of 2 acres and an average depth of 6 feet. A headrace approximately 265 feet long diverts stream flows to a small mill which houses two 12 inch propeller turbines, each

having an installed capacity of 10 kw (20 kw total). A short tailrace discharges flows back into the stream. The total length of the bypassed section of stream is about 270 feet. Gross head at the project site is 25 feet.

3. The hydraulic capacity of each turbine ranges from 6 to 10 cfs.

4. The project is operated as a run-of-the-river facility when inflows to the impoundment are greater than or equal to 7.5 cfs (low end of turbine plus the applicant's estimated leakage through the dam of 1.5 cfs). When inflow to the impoundment is between 4.5 and 7.5 cfs, and the flashboards are in place, one turbine is run and the impoundment is drawn down a maximum of 6 inches (elevation 1349.5') from the top of the flashboards. When project inflow equals 4.5 cfs, it takes about 30 minutes to refill the impoundment following a 6 inch drawdown. This drawdown is regulated by an automatic float switch at the dam. When drawdown is 6 inches below the top of the flashboards, the operating turbine is automatically shut off. When inflow to the impoundment is greater than or equal to 7.5 cfs, the impoundment is not drawn down.

A leakage flow of about 1.5 cfs is maintained in the bypass when inflows to the impoundment are within the operating range of the facility and when the impoundment is being refilled following a drawdown. This flow is from leakage through the flashboards, dam, and a small riser pipe connected to two smaller pipes which are installed in the dam. During periods of

refilling the impoundment after a drawdown, a minimum flow of 3 to 4 cfs is maintained below the project tailrace. This flow is from leakage through the dam and approximately 2 cfs which flows through the headrace at all times when the turbines are not operating.

When inflows to the project are less than 4.5 cfs, the facility does not operate and all flows are spilled at the dam. Flows higher than 21.5 cfs (maximum hydraulic capacity of project plus leakage flow) are also spilled at the dam.

5. According to the applicant, the facility does not normally operate during the months of June, July, August and part of February due to low stream flows.

6. Based on fish population surveys conducted by the Vermont Department of Fish and Wildlife in 1956 and 1976, the upper Green River (project location) and its tributaries support a native brook trout fishery. The bypassed section of stream and the stream section below the project is composed of small pools and cascades providing good nursery and spawning habitat.

7. The Department normally uses the U.S. Fish and Wildlife Service Flow Recommendation Policy for the New England Area as a basis for determining minimum flow requirements at hydroelectric projects where detailed site-specific studies have not been completed. The Department finds that flows derived using the policy are usually sufficient to maintain water quality and fisheries. At the project site, the minimum flow recommendation is equal to 2.7 cfs, or 0.5 cfs/square mile of watershed.

The applicant's estimated leakage flow through the bypass of 1.5 cfs is equal to 0.3 cfs/square mile. This flow should be sufficient to maintain water quality in the bypassed area. During the warmer low flow months of June through August, when water quality would be of most concern, the facility is usually not operating and all flows are spilled at the dam. Due to the quality of fish habitat, however, the Department requested that the applicant conduct a flow demonstration of 1.5 cfs through the bypass to determine if this flow was acceptable. The applicant conducted this demonstration on June 7, 1984 for respresentatives from the Department and the Vermont Department of Fish and Wildlife.

At the time of the demonstration, one turbine was operating and the impoundment had been drawn down 2 inches from the top of the flashboards; an estimated 1 cfs was flowing through one of the small pipes; the other pipe was partially clogged with debris. There was some leakage through the dam, flashboards, and a small amount of water was spilling over the left side of the dam crest.

The applicant had installed a temporary weir in the stream channel on the right side of a small island just below the dam. A temporary rock wall was placed in the left channel. The weir measured a flow of approximately 1 cfs. An additional 1 cfs was leaking around the sides of the weir and through the rock wall. This observed flow of about 2 cfs provided good fish habitat in the bypass.

Based on this flow demonstration, the Department will require the applicant to maintain a minimum flow in the bypass of 2.0 cfs at all times when available from inflow. The Department finds that this flow may not be maintained under present conditions when the drawdown is greater than 2 inches from the top of the flashboards as there would be a reduction in head and a loss of flows over the left side of the dam crest. The Department will, therefore, require the applicant to submit a proposal for review and approval describing how the minimum flow requirement will be maintained at all drawdown stages up to the maximum of six inches.

8. A minimum flow requirement of 2.0 cfs would change project operation accordingly. Drawing down of the impoundment for generation purposes would occur when inflows to the project were between 5.0 and 8.0 cfs. The project would operate in a run-of-the-river mode when inflows to the impoundment were greater than or equal to 8.0 cfs.

9. The Green River at the project site is rated Class B by the State of Vermont Water Resources Board. Class B waters are suitable for swimming, recreation, irrigation and agricultural uses; good fish habitat; good aesthetic value; and are acceptable for public water supply with filtration and disinfection.

The Green River is designated Water Management Type I or II for the protection and management of aquatic life. Dissolved oxygen content of these waters shall not be less than 6 mg/l, and 7 mg/l or greater may be required at and near spawning areas.

CONDITIONS

Based on its review, the Department certifies that the proposed facility will not violate Vermont Water Quality Standards provided the following conditions are met:

A. A minimum flow equal to 2.0 cfs shall be maintained in the bypassed section of stream at all times. When inflows to the impoundment pond are less than 5.0 cfs and when the project is not operating, all flows shall be spilled at the dam.

B. The applicant shall submit to the Department for review and written approval, a description, hydraulic design calculations, and plans for maintaining the minimum flow requirement in the bypass. This information shall be submitted to the Department no later than one (1) month from the date of this certification.

C. A minimum flow equal to 2.7 cfs shall be maintained below the project at all times during periods of refilling the impoundment.

D. The facility shall be operated in a strict run-of-the-river mode (outflows below the project tailrace shall equal inflows to the impoundment) when inflows to the impoundment are greater than or equal to 8.0 cfs.

E. When inflows to the impoundment are less than 8.0 cfs and greater than or equal to 5.0 cfs, maximum drawdown shall be 6.0 inches from the top of the four feet of flashboards. The impoundment shall not be drawn down below this maximum without prior written approval by the Department. This condition does not apply to the removal of the flashboards.

F. Debris associated with project operation shall be disposed of properly.

G. Any desilting of the dam impoundment shall be done in accordance with the Agency of Environmental Conservation's Desilting Policy, a copy of which is attached. The Department shall be contacted prior to any desilting activity.

H. Any significant changes to the project, including repairs to the dam which may alter the existing leakage flow, shall be submitted to the Department for prior review and written approval.

John R. Ponsetto, Commissioner
Department of Water Resources
and Environmental Engineering

Dated at Montpelier, Vermont
this 29th day of June, 1984.

AMD/rh